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(54) Production of electroplated goods free from whiskers

(57) Process for the production of electroplated goods, in particular electroplated wires, substantially free from whiskers, characterised in that the electroplated goods are subjected to subsequent heat treatment, during which they are

heated to a temperature just below the melting point of the tin applied by electroplating or below the eutectic temperature of the tin alloy applied.

The tinned goods are preferably heated to a temperature from 5°C to 30°C below the melting point of tin or below the eutectic temperature.

Heating preferably carried out in an inert gas.

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SPECIFICATION

Process for the production of electrotinne
goods substantially free from whiskers

The invention relates to a process for the
5 production of electrotinne goods, in particular
electrotinne wires, substantially free from
whiskers.

The problem of the formation of whiskers
exists in tinning, especially of wires or conductor
10 tracks. These whiskers, which consist of
filamentous monocystals, grow on tin, for
example on tinned wires or conductor tracks, and
can lead to various troubles, such as, for example
short circuits in conductor tracks, by growing
15 from one conductor track to another and bridging
them. This whisker formation is caused by the
tension in the layer of tin or tin alloy applied. If
this tension decreases in the course of time
through ageing, whiskers are formed as a result of
20 the energy released.

Various measures for avoiding such adverse
formation of whiskers are already known. For
example, if the tin is melted, less whisker
formation occurs. Although layers of tin obtained
25 by hot tinning or by melting layers of tin applied
by electroplating have the advantage of a lower
tendency to form whiskers, they have the
disadvantage that, especially in the case of wires,
the layer of tin applied is asymmetric to the core
30 to be tinned. This asymmetry or non-uniformity of
the layer of tin applied has the disadvantage that
they do not have the minimum coating
thicknesses specified by the relevant standards
over the cross-section mentioned, which means
35 that difficulties may occur during soldering. As a
result of diffusion of atoms from the core
consisting of, for example, copper into the tin
layer applied and vice versa, a copper/tin phase
forms. However, if, because of the non-uniformity
40 mentioned, the layer of tin is so thin that it is
completely occupied by the copper/tin phase, no
further wetting with tin in the context of a
subsequent processing operation can be
achieved. Such a processing operation can be, for
45 example, soldering of a component into a printed
circuit board or soldering of a wire onto a
component, such as, for example, in the
production of capacitors, contamination of the
electrode occurring in the latter case.

The invention is therefore based on the object
of providing a process for the production of
electrotinne goods, in particular electrotinne
wires, substantially free from whiskers, the
invention being characterised in that the
55 electrotinne goods are subjected to subsequent
heat treatment, during which they are heated to a
temperature just below the melting point of the
tin applied by electroplating or just below the
eutectic temperature of the tin alloy applied. The
60 advantage of a tin layer of uniform thickness
produced by electroplating and its substantially
whisker-free formation can thereby be achieved.
This reliably ensures that the layer of tin is
wetttable at all points and hence any subsequent

65 processing operations can be carried out without
problems.

The abovementioned mechanical tension is
released by heating the material to be tinned to a
high temperature, and the formation of whiskers
70 is therefore stopped in a relatively simple and
reliable manner. It is of no importance here
whether the layer of tin applied by electroplating
consists of pure tin or of a tin alloy, such as, for
example, a tin/lead alloy. It is advantageous,
75 especially in the case of tin/lead alloys with a high
lead content, to carry out the heating according to
the invention under an inert gas.

According to another advantageous
embodiment of the process, the tinned goods can
80 be heated to about 5° to about 30°C below the
melting point of tin or to just below the eutectic
temperature of the alloy.

In the heat treatment, according to the
invention, of wires, it has proved particularly
85 advantageous if the wire or wires passes or pass
continuously through a heat treatment zone. The
best results have been achieved with a heating
oven, but heating can also be effected inductively
by infrared treatment or the like. The wire heat-
90 treated in this manner is then advantageously
subjected to enforced cooling, that is to say it
passes through a cooling zone, which can be
realised in the most diverse manners which are
known per se.

Preferably, with tinned piece goods, these can
most advantageously be introduced as such into a
heating oven for the purpose of the heat
treatment according to the invention. When the
heat treatment has been carried out, the piece
100 goods are preferably left to cool at room
temperature.

Claims

1. Process for the production of electrotinne
goods, in particular electrotinne wires,
105 substantially free from whiskers, characterised in
that the electrotinne goods are subjected to
subsequent heat treatment, during which they are
warmed to a temperature must below the melting
point of the tin applied by electroplating or below
110 the eutectic temperature of the tin alloy applied.

2. Process according to claim 1, characterised
in that the tinned goods are heated to a
temperature which is up to 5°C to about 30°C
below the melting point of tin or below the
115 eutectic temperature.

3. Process according to claim 1 or 2,
characterised in that the heating is carried out
under an inert gas.

4. Process according to claim 1, 2 or 3,
120 characterised in that the electrotinne goods are
subjected to the subsequent heat treatment by
continuously passing through a heat treatment
zone, for example in a heating oven.

5. Process according to claim 4, characterised
125 in that the electrotinne goods are subjected to
enforced cooling after the subsequent heat
treatment.

6. Process according to claim 1, 2 or 3, characterised in that the electrotinned goods are subjected to the subsequent heat treatment by introduction as piece goods into a heating oven.

5 7. Process according to claim 6, characterised in that the tinned goods are brought out of the oven when the heat treatment has ended and are exposed to room temperature.

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